

An Analysis of Yongding Hakka Earth Building as Regional Success Design Model

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Abstract:

"Theory that man is an integral part of nature" as an important concept of Chinese traditional culture has deeply integrated into all aspects of the Chinese nation. "The 'nature' stated in the sentence means the 'natural law'" (with reference to the book "The Mystery of the Book of Changes" written by Zeng Shiqiang), "Theory that man is an integral part of nature" is that human beings conform to the nature and the laws of nature and are specifically in harmony with the region. The architectural pattern of the World Cultural Heritage Yongding Hakka Earth Building is a model of successful design based on the characteristics of the region. Therefore, this paper discusses from the perspectives of its materials, location and background.

Keywords:

Earth Building, Hakka, Architecture, Materials, Site Selection, Time and Space

1. Overview of Architectural Pattern of Yongding Hakka Earth Building

The Hakka in Yongding, Hakka is a member of the Han nationality. It is Han immigrants who had moved to south from central plains because of war. They are currently spread all over the world with a population of about 100 million. For the Yongding Hakka, the earliest record was in the Western Jin Dynasty refers to "Pan liaoquan migrated from Henan through Anhui and Jiangxi, and finally settled down in Yongding in Sui and Tang Dynasties" [1].Yongding Hakka clan was formed in the two Song Dynasty, the route to Yongding was basically from Ningdu, Jiangxu--Wuyuan--Ninghua--Changting--Shanghang.

Yongding Hakka Earth Building, the immature soil building is one of the most primitive architectural patterns of mankind. "Archaeology shows that the immature soil buildings were widely used in the Neolithic Age, and buildings in Banpo, Xi'an, Shaanxi province 6,000 years ago were the pattern" [2],Since then, the immature soil architecture has been the normal pattern in China until the Ming Dynasty in the 14th century, when the immature soil was gradually replaced by bricks. However, the Hakka clan that began to form in the Song Dynasty has been inherited and developed in Yongding of southwestern Fujian, and has developed the skills of immature soil building to the utmost.

Yongding Hakka Earth Building refers to the unique use of unprocessed immature soil in Yongding County, southwestern Fujian to build bearing walls for large-scale buildings integrating the functions of gregarious living and defenses, which are composed of three and four stories which are a long-term widely, used residential buildings of Yongding residents. There are dozens of shapes such as Round Building, Square Building and Five Phoenix Building in Yongding Hakka Earth Building (See the Figure 1, Figure 2, and Figure 3). On July 6, 2008, the “Fujian Earth Building”, which is mainly represented by the Yongding Hakka Earth Building, was officially listed on the “World Heritage List” [3]. In the Spring Festival of 2010, the Former General Secretary Hu Jintao visited and inspected the Yongding Hakka Earth Building and commented that “The Hakka Earth Building is a treasure of Chinese culture. It is a model for the harmonious coexistence of big families and small society. The precious heritage shall be well guarded, passed down, and used.” [4]



Figure 1. Round Earth Building.

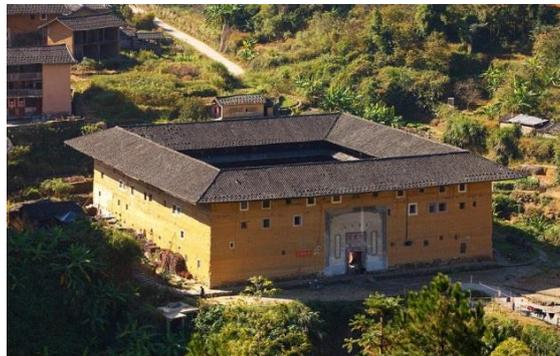


Figure 2. Square Earth Building,



Figure 3. Five Phoenix Earth Building.

As a model of regional successful design, Yongding Hakka Earth Building can be analyzed from materials selection, site selection and functional needs of the regional era.

2. Analysis from the Materials Selection

From the perspective of the history of building development worldwide, earth, wood and stone are used for bearing structure of buildings in the early days. Moreover, all of them are selected depending on the regional characteristics, that is, the selections of natural materials nearby, such as stones are mainly used in the coastal areas of southern Fujian which results in the building pattern relatively monotonous. However, the Yongding Hakka Earth Building has taken these three materials from the local area, and combined organically and comprehensively, and physically transforming the natural materials, creating a “world-famous, unique, fabulous mountain architecture pattern” (UN UNESCO adviser Stevens Andrews). Yongding is located in the mountainous area with inexhaustible soil, wood and stone. The Yongding Hakka Earth Building makes full use of the respective characteristics of the three materials to improve the earth ramming skills to the extreme.

Stone is mainly used for building wall foundations. It is also used to the corridors, patios, floor in front of gates, roads, door frames, steps, column seats and as the building materials placed on the ground to make full use of its waterproof characteristics. And using the stone for door columns and other parts is also a spectacular aesthetic that adds to the Earth Building. (See the Figure 4)



Figure 4. Stone foundation of Earth Building.

The Earth Building is a dwelling house with rammed earth as the main material for bearing structures. Fujian Earth Building is a unique large-scale rammed earth residential building in the world, a creative masterpiece of immature soil building architecture [5]. Rammed earth is a common architectural pattern around the world, but most of it is not over two stories. But the 6 stories of Yonglongchang Building is the highest Earth Building in Yongding, which is nearly 20 meters. This is mainly due to the rational allocation of the “earth” of the ancestors of the Yongding Hakka. The soil used is mainly sandy clay sourced from the layer under the field black soil in pale yellow color, commonly known as “Tian Xia” soil in Chinese [6]. The soil also needs a certain mixing proportion, it cannot be agglomerated and is lack of solidity if too much sand contained; although pure clay is easy to mix, if it is lack of sand will result in crack after drying and lacking of toughness, therefore, Yongding Hakka ancestors mixed the soil according to certain proportion based on specific soil quality. (See the Figure 5)



Figure 5. Rammed Soil Wall Structure of Earth Building.

The Earth Building is made of rammed soil, while the internal structures such as pillars, doors and windows, and slabs are mainly made of wood, but the wood inside the Yongding Earth Building is mostly fir. This is mainly due to the light weight, rich elasticity, and good moisture resistance and not easy to rot of the fir. Relatively speaking, pine has the characteristics of water tolerance. There is a saying of “Pine lives in the water for thousand years, and fir stands erect in the wind for ten thousand years”. Therefore, the wood used in the interior of Yongding Earth Building is mainly fir, and the Earth Building built on the marsh land whose piles are all pine. (See the Figure 6)



Figure 6. Internal wooden structure of the Earth Building.

Yongding Earth Building takes the principle of using local materials and fully combines the characteristics of stone, soil, wood in practice to physically transform them to build the Earth Building without pollution. Even after the building collapses, the soil will be covered with vegetation in a few years; at the same time, the life of the Earth Building is very long, such as the Fuxin Building has a history of 700 years, which still has the people living in. The Earth Building also has green bricks and black tiles after baking, they can generally be reused, that is, the material that is not easy to return to nature could be used to other Earth Buildings after the Earth Building is demolished.

3. Analysis from the Site Selection

Yongding is a typical low-lying hilly landform area. “There are various strange mountains in Fujian, and Yongding is especially in the middle of them. Any road and ladders are not able to reach these majestic and rugged mountains which can’t be described by detailed words. (“Yongding County Annuals” Daoguang Edition). Mountain and hills account for 55% of the total area of Yongding. In this regard, the

location of Yongding Earth Building is based on the premise of fully protecting cultivated land, and exerts individual subjective initiative to find a proper site for locating the building.

Due to the limitation of the specific environment, many livable Earth Buildings are built according to the actual conditions and the geographical conditions. Therefore, the Earth Buildings have more than 30 types of shapes of lower in front and higher behind, round and square, polygon, ellipse, and half-moon. (See the Figure 7). For example, "The Earth Building of Peace locating in Gaodong, Gaotou Town, Yongding is a kind of ladder building. Due to the steep terrain, the foundation can only be divided into front and back platforms. The bungalows are built on the back platform, and the building is built on the front platform, and the bungalow is closely connected to the floor of the building." [7], it is a bit similar to the "Stilted Building" in Guangxi, which the Earth Buildings is built on slopes that cannot be cultivated.

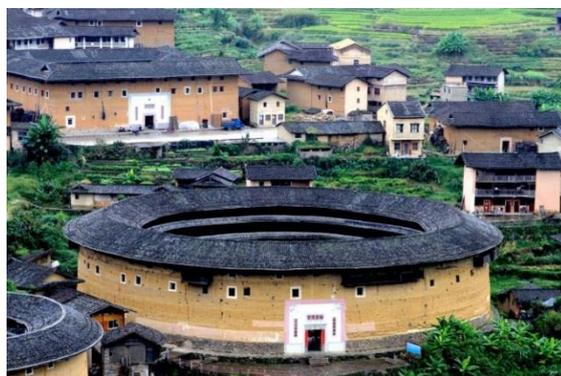


Figure 7. Earth Buildings in Gaotou Town, Yongding.

Fujian Earth Building was sourced from Song and Yuan Dynasties. After the development of the early and middle periods of the Ming Dynasty, it gradually matured in the late Ming Dynasty, the Qing Dynasty and the Republic of China, and is fixed and comes down to now [8]. While making full use of the hillsides that can be built, even if the Yongding Earth Building is built in the cultivated land, the semi-dry land or the periphery of cultivated land will be chosen as much as possible by considering that the soil in these places is relatively strong and is not suitable for farming, but suitable for building Earth Buildings. On the other hand, the selection of location could ensure the relative integrity of large arable land. For example, the Earth Buildings in Daxi, Yongding are basically built in the four directions of the village. The flat water field over 1000-acre in the middle are located with many single Earth Buildings. Up to now, the research shows that the oldest and youngest Earth Buildings are in Cuxi, Yongding, of which the well preserved Jiqing Building with 66m of diameter has 600 years old (See the Figure 8) which shows the concept for protecting the transitional culture by the local people from generation to generation [9].



Figure 8. Jiqing Earth Building.

As mentioned above, Yongding Earth Building was built on the edge of cultivated land, and the newly built Earth Buildings were basically diverged from the original building as the central axis. This is for protecting of the cultivated land, because once the Earth Building is completed, there will be facilities along the perimeter, such as vegetable gardens, roads, pig pens, etc., which are increasingly unsuitable for farming in terms of day-light and geological softness resulting from the above facilities, so the buildings layout adopted is to adapt to the cultivated land. The most typical representative is the ancient village in Zhongchuan, Xiayang, with an area of 0.5 square kilometers and a population of more than 3,000. It gathers more than 100 Earth Buildings of various shapes, connected by houses, and the lanes are winding and winding. There is a saying to describe its intensive said “Fear not to steal but to burn”, it means thieves are easy to get lost; but the fire will be difficult to put out due to the buildings are connected. (See the Figure 9)



Figure 9. Ancient Village in Zhongchuan, Xiayang.

4. Analysis from the Functional Needs of the Regional Era

As a specific orientation, the region is also affected by specific times. The ancestors of the Yongding Hakka migrated southward to avoid the war. The built dwellings inherit the Central Plains culture and are also improved and adapted to the characteristics of the times. This can be explained from the three aspects of inheriting farming civilization, security defense and ventilation.

In the inheritance of farming civilization, "China has established a country with agriculture after the Dayu flood control" (“New Discretion” written by Nan Huaijing), the most important dwellings feature of farming civilization is to live gathered in the form of clan. The concept “self-cultivation, family harmony, country management and world peace”, of which the "family" doesn't mean “home”, but the “extended family”, China is an extended family-based society and then use the same system to govern the country in ancient time. Yongding Earth Buildings are generally

built or purchased by individuals or families, and then extended from generation to generation. This ensures the mutual cooperation of various major activities such as weddings, funerals, and is also suitable for the family to fight against the invasion of foreign enemies. There is a widely circulated saying said, the family continues 10,000 years, but the relatives close three generations only. The building is strictly in accordance with the central axis and takes the hall as the core for interior arrangement. The rooms are arranged according to the age (brothers and generations). If a man is married, a certain space will be distributed to him from the ground floor to the top (kitchen on 1F, granary on 2F, the bedrooms on 3F and 4F). The eldest son is usually located opposite the main entrance and never moves the place, so the arrangement could ensure all members are arranged the space with the ground and roof, which the concept matches with the theory of "man is an integral part of nature". Meanwhile, the patriarch will be elected to deal with the affairs of the family. This is the inherent inheritance of the Chinese farming civilization.

Yongding is located in the mountainous area, when the Hakka ancestors moved in, there were "barren land", where the mountain was high and dense, and the rot smelling that came from the valley was called "miasma" in the north. It is especially bad for people's health. In order to protect the cultivated land, houses are basically built on the mountainside, so that the lighting and ventilation of the Earth Buildings are severely affected. In this regard, Yongding Earth Building is extremely creative in terms of ventilation and lighting. The space between the buildings can always be consciously maintained, because as mentioned above, a building is built by one person, and the adjacent building is built by his descendant; the entrance door is not facing the valley, and one or two floors do not open windows (See the Figure 8 and Figure 10), and tall and evergreen trees are planted behind the building, commonly known as "against evil spirit". In addition, the size of the building is directly proportional to the number of people in the building, so the space in the building is directly proportional. The built bathhouse is also lower than the outer circle, so that it can be solved in terms of lighting and ventilation.



Figure 10. Zhencheng Earth Building.

As mentioned above, the Hakka ancestors went to Yongding to avoid the war, so the defense consciousness was very strong. In addition, it was still a wild land at that time, the beasts and the robbers were infested, and because of the continuous war, the number of people moving south was more and more, and there are also many indigenous people. That is to say, the increase in population and the finite arable land of "eight mountains, one water and 1/10 mu farm land" have gradually intensified, so the defense function of the Earth Building as a residential house is a subject that cannot be circumvented. The defense function of the Earth Building can be explained from five aspects: first, the thick wall, the bottom of the wall of the Earth Building can reach two meters. In the cold weapon era, the general weapons are noneffective.

Secondly, there is only one gate in the Earth Building, the people can't get in when the gate is closed, the floor is thick solid wood board which is afraid of fire attack, therefore, the outside is usually circled with thick iron sheet, and the top is also equipped with a water tank, that is, the water can be used for extinguishing along the door board while the fire attack is used ; Thirdly, the first floor and the second floor of the Earth Building do not open the window, there is no flaw to be attacked; fourthly, the Earth Building generally has four stairs and the inner corridor, that is, the inner corridor is smoothly formed into a circle, once someone attacks, the person in the building can quickly go up and down flexibly condescending from all angles to attack the enemy. Finally, the Yongding Earth Building is provided with kitchen, granary, and accommodation as well as the well water in the building, it can stick to for a few months and wait for the opportunity to repel or ask for help. "At the time of the Agrarian Revolution, the Red Army's Yongding Independent Regiment and the Red Guards assembled in the building to fight against the Kuomintang's "encirclement and suppression" and held it for three months. The militia bombed three times without success." [10]

5. Conclusions

The building will always live in the rotation of time and space, and the transformation of time and space will inevitably to the changes of natural and man-made matters. The Yongding Hakka ancestors moved from the Central Plains to the wild land, they inherited the 5,000-year-old soil ramming technology and exerted it to utmost in the specific time and space, they also inherited the culture of the Central Plains and created a wonders of the mountainous buildings that are bright and colorful among the world's architectural history. At present, regional and national characteristics are increasingly withered; the traditional architectures are marginalized in the imitation and introduction of modern architectural patterns. The regional successful design of the Yongding Hakka Earth Building is an important reminder. Seeking consensus and keeping small difference is an important concept of the Chinese nation. In this regard, small difference is not only a kind of characteristic, but also a kind of creation, which must have its rationality. The building like others should be all-inclusive.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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